What is claimed is

1. A cathode-ray tube device comprising:

a phosphor screen; and

a cold cathode electron gun that includes

(a) a cold cathode having a field emitter array that emits a beam of electrons toward the phosphor screen, and a gate electrode that controls the emission,

(b) a first grid electrode that is positioned between the cold cathode and the phosphor screen,

(c) a second grid electrode that is positioned between the first grid electrode and the phosphor screen,

(d) an electron speed control unit operable to accelerate the electrons that have passed through the gate electrode, by a greater degree as a beam current carried by the beam of the electrons is larger, and

(e) a lens strength control unit operable to enhance a lens strength of an electron lens that is formed by the gate electrode, the first grid electrode, and the second grid electrode, by a greater degree as the beam current is larger.

2. The cathode-ray tube device of Claim 1,

wherein a distance from the gate electrode to one edge of the first grid electrode closer to the phosphor screen in a thickness direction of the first grid electrode is in

a range of 0.10 to 0.35 mm inclusive.

3. The cathode-ray tube device of Claim 1,

wherein the first grid electrode has a through-hole that allows the beam of the electrons to pass through, and

a diameter of the through-hole is in a range of 0.15 to 0.60 mm inclusive.

4. The cathode-ray tube device of Claim 1,

wherein a potential of the first grid electrode is lower than a potential of the gate electrode, regardless of an amount of the beam current, and

the potential of the gate electrode is higher as the beam current is larger.

5. The cathode-ray tube device of Claim 1,

wherein the cold cathode includes a peripheral focusing electrode that is provided on a periphery of the gate electrode, that has a thickness substantially equal to a thickness of the gate electrode, and that has a lower potential than the gate electrode.

6. The cathode-ray tube device of Claim 5,

wherein the peripheral focusing electrode and the first grid electrode are integrally formed.

7. The cathode-ray tube device of Claim 1,

wherein the lens strength control unit enhances the lens strength to form a crossover in the beam of the electrons, at one side of the gate electrode closer to the phosphor screen.